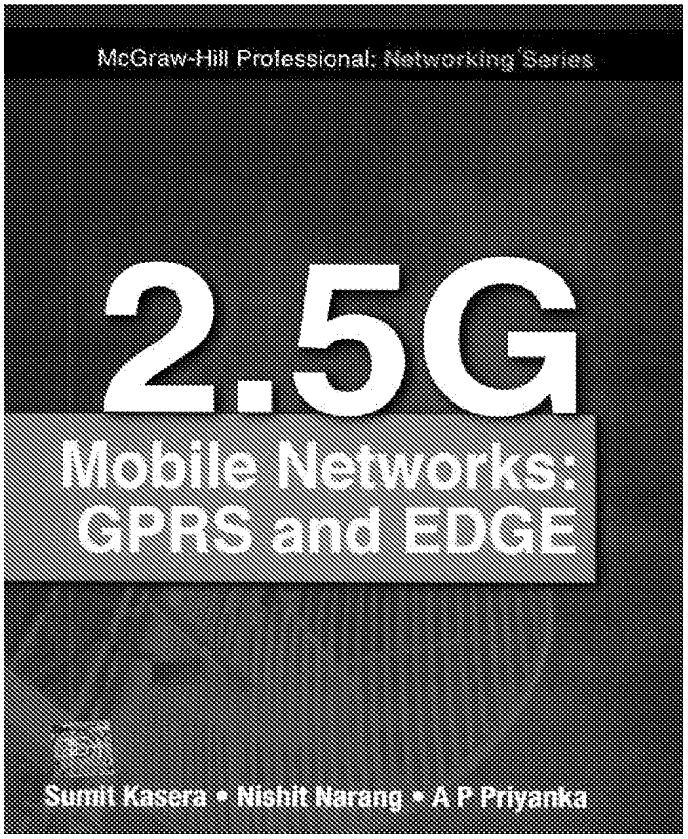
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control and mobility management. The A-interface is based on the BSS application part (BSSAP) as specified in [3GPP TS 48.008]. The BSSAP is itself split into two subapplication parts. These are BSS management application part (BSSMAP) and direct transfer application part (DTAP).

The BSSMAP supports the procedures between MSC and BSS for call handling and resource management (e.g., paging procedures, reset, and handover procedures). This is the main signaling protocol between the MSC/VLR and the BSS. The DTAP essentially provides a relaying mechanism for transfer of MM and CC protocol messages across the BSS. In other words, BSS does not interpret these messages and transfers these messages transparently between MS and MSC/VLR.

The BSSAP protocol messages are carried over the SS7 protocol stack, which includes the SCCP and the MTP protocol. These protocols are not specific to mobile networks and are used in other Public Switched Telephone Networks (PSTN) as well.

1.8.4 GSM Core Network Interfaces

The main signaling protocol used within the GSM core network is the mobile application part (MAP). The MAP protocol defines signaling messages for all control procedures within the core network. This includes procedures for mobility management, call control and supplementary services management. The MAP protocol messages are themselves carried over the SS7 protocol stack.

1.9 GSM Addresses and Identities

In GSM, a number of identifiers are used for the purpose of addressing and identification. Each identifier serves a specific purpose. First comes the international mobile subscriber identity (IMSI) that uniquely identifies a subscriber. An IMSI may be associated with multiple mobile subscriber ISDN (MSISDN) numbers. The MSISDN can be viewed as the mobile phone number or the service identity. Apart from these two identifiers, there is a temporary mobile subscriber identifier (TMSI), which is used to hide the IMSI. To identify an ME, there is the International mobile station equipment identity (IMEI), which uniquely identifies an ME globally. There are other temporary identities as well whose need and function are detailed later in this section.

Then there are E.164 addresses used to identify network entities.

All these identifiers and addresses are explained in the following sections (see also Table 1.2). The reader is referred to [3GPP TS 23.003] for complete information on numbering, addressing, and identification schemes used in a GSM network.

1.9.1 Subscriber Identity

A subscriber is uniquely identified by its IMSI. The IMSI is stored in the SIM within the MS and kept hidden from ordinary access. As shown in Fig. 1.27, the IMSI is divided into three

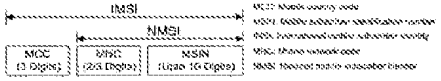
TABLE 1.2

GSM Addresses and Identifiers

Identity	Description	Composition
IMSI	Permanent identity that uniquely identifies a subscriber	MCC + MNC + MSIN
MSISDN	Service identity that is used for communication with a subscriber	CC + NDC + SN
TMSI	Temporary identity that is used to hide the permanent identity IMSI of a subscriber	4 octets (chosen by operator)
LMSI	Temporary identity that is used by VLR to optimize database search	4 octets (allocated by VLR)
MSRN	Temporary identity that is allocated by VLR and is used to route calls directed to an MS	CC + NDC + SN
IMEI	Permanent identity that uniquely identifies an MS	TAC + SNR
Location Number	Refers to the geographical position of the MS in terms of standardized coordinates	CC + NDC + LSP
E.164 address	Used by MSC, GMSC, SIR, HLR, and VLR for the purpose of signaling	CC + NDC + SN

FIGURE 1.27

Structure of IMSI



distinct parts. The first three digits of the IMSI is the MCC. The MCC identifies the country of domicile of the mobile subscriber. The next two or three digits is the MNC. The MNC identifies the home PLMN of the subscriber. The home PLMN of a subscriber is the mobile network to which the mobile subscriber is permanently associated. The last field of IMSI is the mobile subscriber identification number (MSIN). The MSIN uniquely identifies a subscriber within a PLMN. The combination of MNC and MSIN is called the national mobile subscriber identity (NMSI).

1.9.2 Service Identity

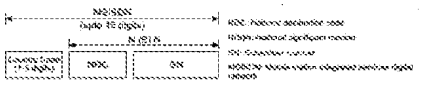
The mobile number used to contact a person is the MSISDN number and not the IMSI. Thus, an MSISDN can be viewed as a service identity because a subscriber may have multiple MSISDN, where each MSISDN identifies a particular service (voice call, fax, etc.). In other

words, while the IMSI is a subscriber identity, the MSISDN is the service identity associated with the subscriber.

The MSISDN numbers are based on the ISDN numbering plan and allocated in such a manner that fixed-line ISDN or PSTN subscribers can call any mobile subscriber. The ISDN numbering plan is based on ITU-T specification E.164.

Figure 1.28 shows the structure of MSISDN. Like IMSI, an MSISDN number is composed of three distinct parts: a CC, a national destination code (NDC), and a subscriber number (SN). There is a one-to-one analogy between the elements of IMSI and MSISDN. The basic difference between the two is the number of digits allocated to individual elements. The country code is from 1 to 3 digits.

FIGURE 1.28
Structure of MSISDN

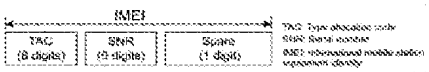


The MSISDN can be of a maximum of 15 digits. The size of national (significant) number depends upon the size of country code and can be of a maximum of 14 digits (when country code is of 1 digit).

1.9.3 Equipment Identity

An MS is identified uniquely by its IMEI. The IMEI is a 15-digit identifier and has a structure as shown in Fig. 1.29. The first eight digits form the type allocation code (TAC). The next six digits form the serial number (SNR). The last digit is spare and set to 0.

FIGURE 1.29
Structure of IMEI



The IMEI is used to uniquely identify an ME globally. It can be used to track a stolen handset. The IMEI of a handset can be known by typing the string *#06# (star hash 0 6 hash) on the MS.

1.9.4 Temporary Identities

Apart from IMSI and MSISDN, there are temporary identifiers used for specific purpose. These temporary identifiers are as follows:

- Temporary mobile subscriber identity (TMSI)